

# VU Research Portal

## **Labor supply shocks and unemployment persistence; modeling labor market dynamics in the Netherlands**

den Butter, F.A.G.; Jongen, E.L.W.; Kock, U.

### ***published in***

Econometric Modeling Research  
2007

[Link to publication in VU Research Portal](#)

### ***citation for published version (APA)***

den Butter, F. A. G., Jongen, E. L. W., & Kock, U. (2007). Labor supply shocks and unemployment persistence; modeling labor market dynamics in the Netherlands. In W. N. Toggins (Ed.), *Econometric Modeling Research* Nova Publishers.

### **General rights**

Copyright and moral rights for the publications made accessible in the public portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.

- Users may download and print one copy of any publication from the public portal for the purpose of private study or research.
- You may not further distribute the material or use it for any profit-making activity or commercial gain
- You may freely distribute the URL identifying the publication in the public portal ?

### **Take down policy**

If you believe that this document breaches copyright please contact us providing details, and we will remove access to the work immediately and investigate your claim.

### **E-mail address:**

[vuresearchportal.ub@vu.nl](mailto:vuresearchportal.ub@vu.nl)

# LABOR SUPPLY SHOCKS AND UNEMPLOYMENT PERSISTENCE

Modeling labor market dynamics in The Netherlands

*Frank A.G. den Butter<sup>‡</sup>, Egbert L.W. Jongen<sup>†</sup> and Udo Kock<sup>§</sup>*

<sup>‡</sup> Corresponding author: Tinbergen Institute and Free University, Department of Economics: De Boelelaan 1105, 1081 HV Amsterdam, The Netherlands, email: [fbutter@feweb.vu.nl](mailto:fbutter@feweb.vu.nl); phone: +31-20-5986044, fax: +31-20-5989870.

<sup>†</sup> CPB Netherlands Bureau for Economic Policy Analysis, The Hague, email [e.l.w.jongen@cpb.nl](mailto:e.l.w.jongen@cpb.nl)

<sup>§</sup> International Monetary Fund<sup>1</sup>, Washington DC, email: [ukock@imf.org](mailto:ukock@imf.org)

We are grateful for helpful comments and suggestions from Jaap Abbring, Paul Frijters, Thomas de Graaf, Bas van der Klaauw, Jan de Kok and participants at the IZA Seminar in Labor Economics in Buch/Munich, June 2000. All remaining errors are ours.

## ABSTRACT

Using a small stock-flow model, we identify two mechanisms that caused persistence in labor market adjustments in The Netherlands: (i) job competition from non-participants, and (ii) asymmetric adjustments to cyclical shocks. Our model endogenizes the adjustment dynamics to (un)employment search equilibria. At the core of our model is an estimated matching function. Using Dutch flow data for the period 1970-1997 we find that the search effectiveness of individuals on welfare benefits and non-participation is 0.33 respectively 0.05 of the search effectiveness of individuals receiving unemployment insurance. In accordance with actual developments in the reference period, our model simulations show that, when the flow from non-participants into the labor market rises permanently, the unemployment rate rises quickly and stabilizes at a higher level whereas employment continues to rise. Yet, a sensitivity analysis with alternative assumptions on the type of supply shocks and the reaction of labor demand to these shocks indicates that the adjustment dynamics, and hence the degree of persistence, depend much on the search behavior of non-participants.

**JEL codes:** J64, J65, J68, E24, E27

**Keywords:** labor supply, matching models, unemployment persistence, labor market dynamics

---

<sup>1</sup> The views expressed in this article are those of the author and should not be attributed to the International Monetary Fund, its Executive Board, or its management

## 1. INTRODUCTION

This article investigates the role played by labor supply shocks, social security and the business cycle in the rise and persistence of unemployment in The Netherlands over the period 1970-1997. During the 1970s and 1980s The Netherlands witnessed a dramatic rise in the unemployment rate. This rise was characterized by a number of upward jumps; steady state unemployment seemed to move to a higher level after each cyclical downturn. In the late 1990s, total unemployment in The Netherlands was around 1.5 million workers (17 percent of the labor force), including official unemployment and unemployment hidden in occupational disability and temporary illness provisions. This percentage has changed little since then, and only because of a growing labor force, not because of a significant change in the total numbers of unemployed and disabled workers. If we take the share of workers receiving social benefits as an indication of ‘inactivity’, we find that since the mid 1980s ‘inactivity’ has stabilized at around 20 percent of the labor force.

Most European countries witnessed the same dramatic rise and persistence in unemployment (see e.g. Bean (1994)). However, in The Netherlands the persistence in social benefits and unemployment ratios occurred despite rising employment. In 1975, 61 percent of the working age population in The Netherlands was employed, whereas the average participation rate in the European Union was 64 percent. Since the mid 1980s through the recession of 2001, the average growth of employment was 2.0% in The Netherlands, versus 0.9% percent in the European Union (OECD (2002)). The employment rate in The Netherlands nowadays is 73 percent, well above the European average of 64 percent (OECD (2005)).

The Dutch paradox of increased employment and persistent social benefit dependency raises the question of who filled the newly created jobs? The data suggest that it was mainly non-participants (most notably school leavers and women re-entering the labor market) who benefited from the rising number of jobs in the late 1980s and throughout the 1990s. This suggests that receivers of social security benefits witnessed fierce competition from non-participants when searching for new jobs. This observation inspired us to investigate job competition from non-participants as a major mechanism that caused persistence in unemployment by means of a small empirical stock-flow model for the Dutch economy. The model makes the adjustment dynamics to (un)employment search equilibria endogenous. Additionally, in our modeling experiment, we also considered another, related mechanism as a cause of unemployment persistence, namely asymmetric adjustments to cyclical shocks.

In this way our article adds to the large body of literature on several other factors which may prevent a quick return of the unemployment rate to its long run equilibrium after a labor demand or supply shock, and which therefore may explain unemployment persistence. We mention employment adjustment costs for firms, adjustment costs for workers (e.g. costs involved in labor force participation), wage-price staggering effects, and insider-outsider effects. Yet in recent years hazardous welfare state dynamics have been added to this list, so that factors that are related to the mechanisms of our article are nowadays considered important causes of unemployment persistence, notably in Europe. These factors relate to loss of skills in unemployment, declining job search efforts of receivers of social security benefits and increasing social acceptance of long term social welfare dependency (Bean (1994), Lindbeck (1995), Snower (1997), Chen, Snower and Zoega (2003), Ljungqvist and Sargent, (2005)).

An analysis of the process of matching job seekers and vacancies can provide information on the impact of policy measures that intend to increase labor force participation. Our analysis shows that promoting labor force participation stimulates employment but may lead to a substantial rise in

unemployment for a prolonged period, in particular when prolonged unemployment leads to a reduction of the average search effectiveness of unemployed job seekers, as our estimation results indicate.

The article has the following outline. Section 2 specifies the flow model of the labor market, which describes the propagation of shocks and the resulting dynamic adjustments to search equilibria. Using flow data for the Dutch labor market over the period 1970-1997, Section 3 presents the estimation results for the parameters in the matching function, which allows for job-competition between unemployed workers, receivers of welfare benefits and non-participants. It also describes how the baseline simulation model is calibrated to a search equilibrium which concords with actual data on labor flows and stocks. Section 4 gives the simulation results for the propagation of supply shocks, cyclical (demand) shocks and presents a sensitivity analysis with respect to the implementation of the shocks. Finally, a summary of the main findings and some concluding remarks are given in Section 5.

## 2. THE MODEL

A major feature of our model is that it explicitly describes the short run transition dynamics from an old to a new (un)employment search equilibrium in case of permanent shocks, or the dynamics of the return to the old equilibrium after a temporary shock. So, in contrast to traditional dynamic policy models which describe adjustment mechanisms at an *ad hoc* basis, e.g. by an error correction mechanism, our model derives its adjustment from the passage of time implicit in the search process (see also Den Butter and Van Dijk (1998), Den Butter and Gorter (1999)). Because our model focuses so much on adjustment dynamics the calibrated version of the model used in the simulation experiments is specified on a monthly basis.

According to the model, individuals in the working age population can be in one of four states on the labor market: employment ( $E$ ), unemployment and receiving insurance benefits ( $UI$ ), unemployment and receiving welfare benefits ( $WB$ ) and non-participation ( $N$ ). Unemployed workers entitled to unemployment benefits (i.e. unemployment insurance) are unemployed workers with a recent history of labor force attachment. When this insurance benefit expires, the unemployed worker is entitled to welfare benefits. Welfare recipients mainly consist of long-term unemployed workers. Jobs in the labor market can be either filled and producing ( $E$ ) or vacant and searching ( $V$ ). The distribution of workers and jobs over the different states depends on the flows between them. The flow rates into employment are endogenous and are determined by the matching function. The other flow rates, and hence the respective transition probabilities are exogenous in the model and are calibrated using data on actual transition probabilities. The stocks and flows in the model are given in Figure 1. The dashed lines represent the endogenous flows; the solid lines represent the exogenous flows.

At the core of the model is the matching process that describes the competition of the three different groups of job searchers in their effort to fill existing job vacancies. This makes the inflow into employment from the three different groups and hence the transition probabilities endogenous. Three matching functions determine the speed at which job seekers and vacancies are matched. The matching functions for the three groups of job seekers are given by

$$M_i = c \left( \frac{V}{\sum_i \theta_i S_i} \right)^\alpha \theta_i S_i, \quad i = UI, WB, N, \quad [1]$$

where  $M_i$ ,  $\theta_i$  and  $S_i$  denote the number of matches for, the search effectiveness of and the stock of job seekers from state  $i$ .  $V$  denotes the stock of vacancies.  $c$  and  $\alpha$  are matching technology parameters. The matching functions for the three groups of job seekers can be aggregated to yield a constant-returns-to-scale aggregate matching function, which is typically not rejected in empirical work on the Dutch labor market, Broersma and Van Ours (1999). The aggregated matching function then reads

$$M = cV^\alpha (\sum_i \theta_i S_i)^{1-\alpha}, \quad [2]$$

where  $M$  is the number of matches, and hence the inflow into employment, in a given time interval. In the next section we estimate the parameters of the matching function using data for the period 1970-1997.

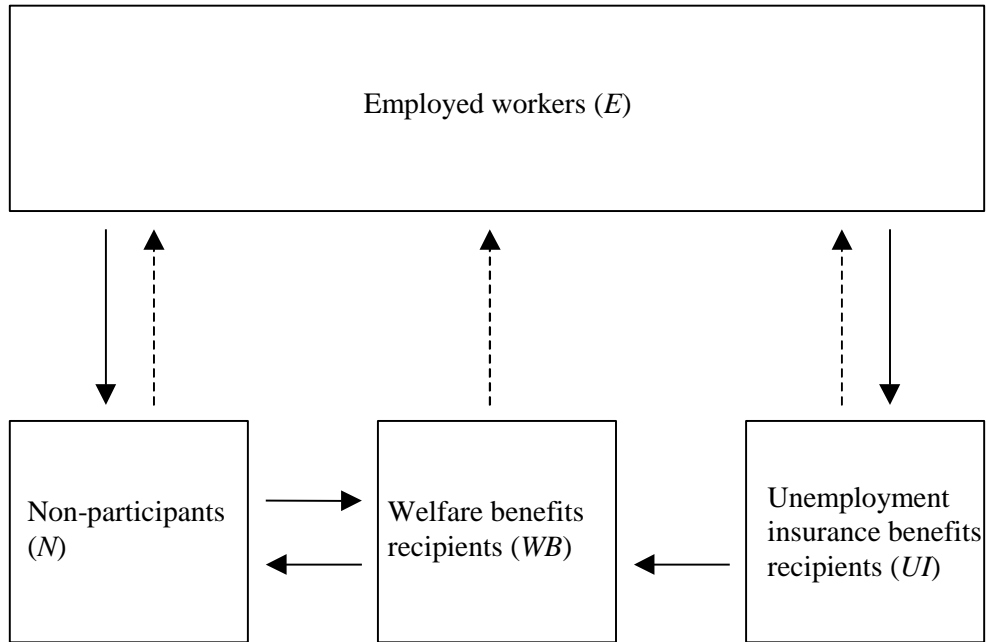


Figure 1 — Stocks and flows in the labor market

The remainder of our simple model consists of the equations of motion, which describe the technical relationships that, by definition, exist between the stocks and flows. The following four equations determine the stocks of  $UI$ ,  $N$ ,  $WB$  and  $E$  in period  $t$  by their values in the previous period – the period in the model is one month – and the net result of inflows and outflows in that period.

$$UI_t = UI_{t-1} + \pi_{E \rightarrow UI} \cdot E_{t-1} - \pi_{UI \rightarrow WB} \cdot UI_{t-1} - c \cdot \left( \frac{V_{t-1}}{\sum_i \theta_{i,t-1} S_{i,t-1}} \right)^\alpha \cdot \theta_{ui,t-1} UI_{t-1}, \quad [3]$$

$$\begin{aligned}
WB_t = & WB_{t-1} + \pi_{UI \rightarrow WB} \cdot UI_{t-1} + \pi_{N \rightarrow WB} \cdot N_{t-1} \\
& - \pi_{WB \rightarrow N} \cdot WB_{t-1} - c \cdot \left( \frac{V_{t-1}}{\sum_i \theta_{i,t-1} S_{i,t-1}} \right)^\alpha \cdot \theta_{wb,t-1} WB_{t-1},
\end{aligned}
\tag{4}$$

$$\begin{aligned}
N_t = & N_{t-1} + \pi_{E \rightarrow N} \cdot E_{t-1} + \pi_{WB \rightarrow N} \cdot WB_{t-1} \\
& - \pi_{N \rightarrow WB} \cdot N_{t-1} - c \cdot \left( \frac{V_{t-1}}{\sum_i \theta_{i,t-1} S_{i,t-1}} \right)^\alpha \cdot \theta_{n,t-1} N_{t-1},
\end{aligned}
\tag{5}$$

and

$$E_t = E_{t-1} - \pi_{E \rightarrow UI} \cdot E_{t-1} - \pi_{E \rightarrow N} \cdot E_{t-1} + c \cdot V^\alpha \left( \sum_i \theta_{i,t-1} S_{i,t-1} \right)^{1-\alpha},
\tag{6}$$

where  $\pi_{x \rightarrow y}$  denotes the flow rate from state  $x$  to state  $y$ .

These flow rates, or transition probabilities are the major determinants in the equations of motion. As mentioned before, in the present version of the model these rates are kept exogenous. The following shortly discusses these flow rates.

- *Flow rate from employment to unemployment insurance* ( $\pi_{E \rightarrow UI}$ ). In our model we make the simplifying assumption that all workers who become unemployed are entitled to unemployment insurance benefits. In reality a small portion of the new inflow into unemployment receive welfare benefits, notably those workers with a very short employment history. Our assumption of a fixed flow rate from employment to unemployment insurance is supported by the stylized fact that lay-offs into unemployment are mainly driven by firm-specific shocks and that the business cycle has a limited impact on the size of the inflow into unemployment (Davis, Haltiwanger and Schuh (1996))<sup>2</sup>.
- *Flow rate from employment to non-participation* ( $\pi_{E \rightarrow N}$ ). This flow represents workers who leave the workforce permanently (retirement and early retirement) or temporarily (for example disabled workers who might return to their job when recovered and workers who leave the labor force temporarily to take care of young children). The inflow into non-participation for reasons of (early) retirement or disability is highly influenced by policy changes in these social benefit schemes. It turns out however that the aggregate inflow into non-participation from these three sources is between 2 and 3 percent of the employed labor force for the period 1970-1997 (Kock (1998)).
- *Flow rate from welfare benefits to non-participation* ( $\pi_{WB \rightarrow N}$ ). There are a number of reasons why people can lose entitlement to their welfare benefit. The most common reason is a change in the personal circumstances, for example when a benefit recipient moves in with a person who is employed. In extreme cases a person can lose his benefit if he does not comply with the job search requirements. This flow rate could be influenced by policy changes, but these appear to have been limited in The Netherlands.

<sup>2</sup> Modeling the rate at which job-worker matches dissolve as a constant is a common feature of search models of the labor market (see Van den Berg and Ridder (1998)).

- *Flow rate from non-participation to welfare benefits* ( $\pi_{N \rightarrow WB}$ ). This flow represents school-leavers who become unemployed or persons who experience a change in their personal circumstances that makes them eligible for welfare benefits (e.g. divorce). We use this variable to implement changes in the supply of labor from non-participants in our model.
- *Flow rate from unemployment insurance to welfare benefits* ( $\pi_{UI \rightarrow WB}$ ). In The Netherlands, after six to forty-eight months, depending on the individual's employment history, entitlement to unemployment benefits expires. Subsequently unemployed workers receive welfare benefits.  $\pi_{UI \rightarrow WB}$  can therefore also be interpreted as the transition rate from short-term to long-term unemployment. At the macro level this rate depends on the duration structure of the stock of workers receiving unemployment insurance benefits. We leave this refinement for future research.

Finally we have to make an assumption about the reaction of labor demand, represented by the stock of vacancies, to autonomous shocks that bring the model out of its search equilibrium. In our baseline model we assume that labor demand adjusts so as to keep the ratio of vacancies over the number of effective job seekers ( $V/\sum_i \theta_i S_i$ ) unchanged after a labor supply shock, as suggested by search theory (see e.g. Pissarides (2000), Chapter 3). This implies that in response to a positive (negative) shock to labor supply vacancies jump above (below) their steady-state level for as long as the effective supply of labor deviates from the steady state level. The rationale behind this is that wage and search costs fall as the effective supply of labor rises above its steady state level. In this case the number of vacancies is given by

$$[7] \quad V_t = V^* + \xi \left( \theta_{ui,t-1} UI_{t-1} + \theta_{wb,t-1} WB_{t-1} + \theta_{n,t-1} N_{t-1} - \theta_{ui} UI^* - \theta_{wb} WB^* - \theta_n N^* \right),$$

where  $V^*$ ,  $UI^*$ ,  $WB^*$  and  $N^*$  denote the steady-state levels of the respective stocks in the new equilibrium after the shock. To keep the ratio of vacancies to effective job seekers constant in our baseline model we set the vacancy adjustment parameter  $\xi$  equal to  $V^*/\sum_i \theta_i S_i^*$ .

This baseline version of the reaction of labor demand to shocks assumes immediate adjustment of the number of vacancies to the effective number of job seekers. As an alternative, we also conducted simulation experiments, where the number of vacancies does not change in reaction to a shock. This extreme situation we label the lump of labor assumption. In this case we set  $\xi$  equal to zero.

The model [2] – [7] is an empirical implementation of an equilibrium search model with heterogeneous job searchers (Pissarides (2000)). Competition from non-participants is expected to reduce the outflow probability of unemployed workers to employment. The impact of changes in the degree of competition from unemployed job seekers on the individual job seeker's outflow probability to employment depends on labor market tightness, i.e. on the level of unemployment and the stock of vacancies. Obviously the same applies to individual job seekers outside the labor force. A higher unemployment rate reduces the matching probability for the individual, *ceteris paribus*.

These search externalities can generate inefficient labor market outcomes as job seekers, in making their individual job search decisions, do not take into account the effect their individual decision has on the job-finding probability of other job seekers in the labor market and hence on the impact their individual job search decisions have on the unemployment rate and on macroeconomic efficiency. The same applies to employers posting vacancies. In our model search externalities are captured, through the matching function and the endogenous adjustment process, as changes in labor

supply from one group (e.g. non-participants) influence the matching probabilities of other groups and the unemployment rate.

### 3. ESTIMATION AND CALIBRATION

In order to estimate the parameters of the matching functions [1], and to calibrate the equations of the remainder of the model, we need time-series of job and worker flows at the macro level. We use data for the Dutch labor market that were made available by Kock (1998, 2000) and Broersma, Den Butter and Kock (2000). The data is constructed with a national accounting methodology. The basic idea of this methodology is that, given a number of stocks and flows from primary sources and some assumptions, missing time-series can be constructed using the simple accounting rule which states that the change in a stock equals the inflow minus outflow in a given period. The accounting system is made consistent because all relevant groups in the labor market are included and the restriction is imposed that flows cannot yield negative values. Data on successful job matches of unemployed workers receiving unemployment benefits is obtained from primary administrative data sources from the Dutch National Institute for Social Insurance (LISV). Time series on successful matching from short-term unemployment, disability and non-participation for example are constructed using the national accounting method. The flows between unemployment and non-participation and the outflow from unemployment are also included in the accounting system of labor market flows. In this article we use annual data because these are available for the period 1970-1997, whereas consistent quarterly flow data could only be constructed starting 1988. The appendix provides details on each of the time series used in this article. Unfortunately these flow data constructed according to the national accounting system are not available for the period beyond 1997, so that the observation period used in the estimation could not be extended.

#### *Estimating the matching function*

The previous section discussed that inflow into employment is determined by the matching

function  $M = cV^\alpha \left( \sum_i \theta_i S_i \right)^{1-\alpha}$ . We assume that all three types of job seekers face the same degree of mismatch and search frictions, i.e. they all face a common  $c$ . If we normalize the search effectiveness of individuals receiving unemployment insurance benefits to 1, we can estimate the following equation

$$[8] \quad M = c \cdot V^\alpha \cdot (UI + \exp(\theta'_{wb}) \cdot WB + \exp(\theta'_n) \cdot N)^{1-\alpha} + \varepsilon$$

The estimation results are given in Table 1. We use a non-linear iterative estimation procedure and we correct for first order auto-correlation.

**Table 1 — Estimation results**

	$C$	$\alpha$	$\theta'_{ui}$	$\theta'_{wb}$	$\theta'_n$	$AR(I)$
Coefficient	1.94	0.23	0	-1.10	-2.98	0.57
	(4.78)	(4.54)		(-2.31)	(-8.41)	(2.80)
# Observations:	28	$R^2$ :	0.96	Durbin-Watson:	1.84	

Estimation period: 1970-1997. t-values in parentheses.



The estimated matching function then reads,

$$[9] \quad M = 1.94 \cdot V^{0.23} (UI + 0.33 \cdot WB + 0.05 \cdot N)^{0.77}.$$

The search effectiveness is the lowest for non-participants. Our point estimate of 0.05 is quite close to scattered evidence from the Labor Market Survey of The Netherlands Central Bureau of Statistics (CBS). For the late 1980s and early 1990s they report that approximately 7 percent of the non-participants is actively searching for a job. Combining these two percentages would imply that the search effectiveness of non-participants who are active job seekers is somewhat below the search effectiveness of individuals receiving unemployment insurance benefits (provided that we assume that all of these unemployed workers are active job seekers). Furthermore, we find that the search effectiveness of individuals receiving welfare benefits is one-third of the search effectiveness of individuals receiving unemployment insurance benefits. Broersma and Van Ours (1999) report that scattered information from the Dutch Ministry of Social Affairs and the CBS indicates that 50 percent of the workers receiving welfare benefits are actively searching for a job.

The estimated matching elasticity of job seekers, i.e.  $1-\alpha$ , equals 0.77. Estimates for other OECD countries range from 0.1 to 1.0, depending on the specification of the matching function and the variables used. For The Netherlands estimates of the elasticity of matching of job seekers range from 0.3 (Gorter and Van Ours (1997), Van Ours (1995)) to 0.7 (Broersma (1997), Van Ours (1995)). Apparently our estimate is well in accordance with these latter studies. Yet it should be noted that these studies use the stock of unemployed workers as a proxy for the total effective number of search units  $\sum S_i$ ,  $i=UI, WB, N$ . Broersma and Van Ours (1999) show that the estimated matching elasticity with respect to the number of job seekers in the aggregate matching function is biased downward if only unemployed job seekers are taken into account. They prove that ‘ignoring the non-unemployed job seekers will give too low an estimate of the supply side effect of the matching function’ (p. 87). In their empirical analysis they use a single, rough approximation of all non-unemployed job seekers (including on-the-job search) and find an elasticity of matching that is remarkably close to ours (0.74).

### **Calibration**

We calibrate the model by imposing a steady state, where we take the average values for the stocks over the period 1970-1997 as the steady state level. Given the data on the flow from the stock of unemployed workers receiving insurance benefits ( $UI$ ) to the stock of unemployed workers receiving welfare benefits ( $WB$ ), we derive the flow rate from employment to  $UI$  ( $\pi_{E \rightarrow UI}$ ) using the steady state condition for the latter. Given this flow rate we can determine the flow rate from employment ( $E$ ) to non-participation ( $N$ ) from the steady state condition for employment. Finally, using data for the flow rate from non-participation to welfare ( $\pi_{N \rightarrow WB}$ ) we can derive the flow rate from the stock of workers receiving welfare benefits to non-participation ( $\pi_{WB \rightarrow N}$ ) from the steady state condition of either  $N$  or  $WB$ . Table 2 gives the equilibrium stocks and flows of the model.

**Table 2 — Equilibrium in the benchmark case**  
(stocks and flows  $\times 1000$ )

<i>Equilibrium</i>	<i>Symbol</i>	<i>Value</i>
<i>Stocks</i>		
Employed workers	$E$	5268
Unemployed workers receiving unemployment insurance benefits (effective number of job seekers)	$UI (\theta_{ui}UI)$	161 (161)
Unemployed workers receiving welfare benefits (effective number of job seekers)	$WB (\theta_{wb}WB)$	207 (68.31)
Non-participants (effective number of job seekers)	$N (\theta_n N)$	3634 (181.70)
Vacancies	$V$	86
<i>Flow rates<sup>a</sup></i>		
Employment to unemployment insurance	$\pi_{E \rightarrow UI}$	0.004
Welfare benefits to non-participation	$\pi_{WB \rightarrow N}$	0.028
Employment to non-participation	$\pi_{E \rightarrow N}$	0.005
Non-participation to welfare benefits	$\pi_{N \rightarrow WB}$	0.003
Unemployment insurance to welfare benefit	$\pi_{UI \rightarrow WB}$	0.026
Unemployment rate	$u$	6.53 %

<sup>a</sup>Monthly flow rates.

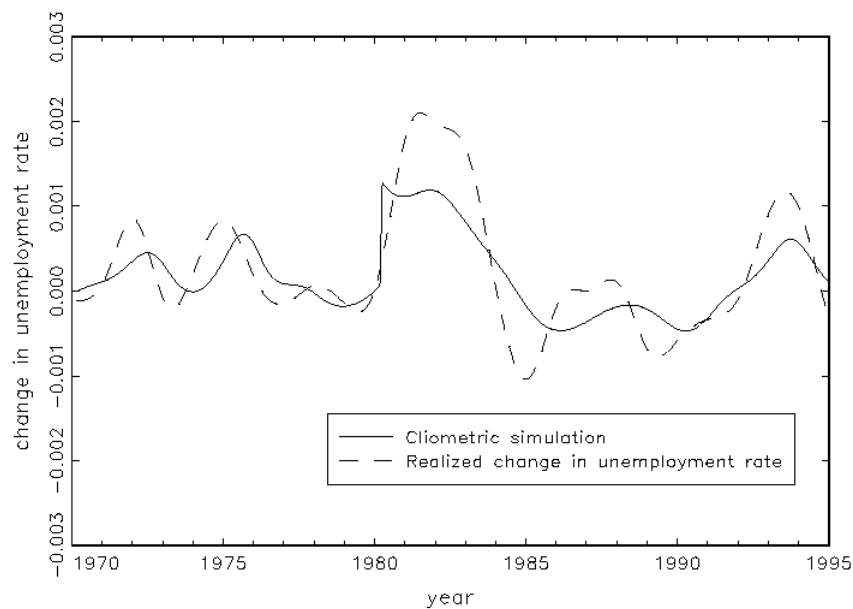


Figure 2 — Cliometric simulation: impact of a doubling of job search from non-participants, with realized vacancies

### *A cliometric simulation of unemployment dynamics*

In order to give some indication on how our calibrated model mimics actual developments in the reference period, we conducted a kind of cliometric simulation where we imputed realized vacancies, and implemented an exogenous 50 percent rise in both the flow from non-participation to welfare and the search effectiveness of non-participants in the 1980s. It appears from Figure 2 that, given actual labor demand and the matching process [9], the rise in job competition from non-participants generates unemployment dynamics with similar (persistence) characteristics as the observed unemployment rate in The Netherlands in the relevant period (the simple correlation coefficient between the real and the simulated unemployment rate is 0.99).

## **4. IMPULSE RESPONSE SIMULATIONS**

A first set of impulse simulations using our calibrated stock-flow model is conducted in order to investigate the impact of job competition from non-participants on the unemployment rate and labor market adjustment. These simulation experiments should provide us with more information on the (adjustment) mechanisms behind the Dutch paradox of increased employment and persistent social benefit dependency. More specifically we computed the dynamic responses to both positive and negative, and both temporary and permanent labor supply shocks, implemented either as shocks to the inflow of non-participants, or as changes in the search effectiveness of non-participants. All simulations are conducted under the two alternative assumptions with respect to the response of labor demand, namely the immediate adjustment of the number of vacancies in the new equilibrium and the lump of labor assumption.

In a second set of simulations we investigate the consequences of business cycle swings on unemployment persistence by means of positive and negative labor demand shocks. Here asymmetric reactions to shocks may explain (part of) the unemployment persistence.

### *Temporary positive/negative shock to labor supply from non-participants*

In Figure 3 we present the impact of a change in labor supply from non-participants where the shock is modeled as a temporary change in the flow from non-participation to the stock of unemployed workers receiving welfare benefits ( $\pi_{N \rightarrow WB}$ ), i.e. unmatched additional labor supply joins the unemployment pool. We impute a 50 percent increase in the flow rate in the first 12 months of the simulation.

The effective number of job seekers rises due to the rise in the flow from non-participation to welfare, as welfare recipients search more effectively for jobs. However, the matching technology accommodates only part of the shock in any given period, with and without an adjustment of the number of vacancies to the effective number of job seekers. Hence, the increased inflow pushes unemployment above its equilibrium level. Unemployment stays above its equilibrium level for approximately 5 year.

Next we examine the impact of a temporary rise in the search effectiveness of (or, equivalently, number of) non-participants, where unmatched non-participants do not flow into unemployment but remain outside the labor force. Simulation results are given in Figure 4.

Both when the stock of vacancies remains constant and when it rises with the rise in the effective number of job seekers we find that unemployment now is hardly affected by the rise in the effective supply of labor. When vacancies adjust, employment absorbs more of the additional

effective labor supply than when vacancies remain fixed. Note that the pool of individuals receiving unemployment insurance benefits rises slightly more when vacancies do not adjust, despite the less steep rise in employment (which increases the inflow into the pool of unemployed workers receiving unemployment insurance benefits). Unemployed workers face more competition from non-participants, in particular when vacancies do not adjust.

The impact of the temporary rise of labor supply from non-participants on unemployment is most pronounced when the unabsorbed additional job seekers join the unemployment pool (Figure 4). If we assume that unmatched non-participants remain outside the labor force, then the impact on unemployment is limited. Figures 3 and 4 show that the impact on unemployment of a positive and a negative shock to the inflow into unemployment and the share of non-participants searching for a job is symmetric.

The impact of changes in labor supply from non-participants on employment is most pronounced when vacancies adjust to the increase in labor supply. It is, however, noticeable that the difference between the two labor market regimes is very limited when the rise of labor supply is modeled as an increase in the flow from non-participation to welfare (Figure 3).

#### ***Permanent positive/negative shock to labor supply from non-participants***

Figure 5 presents the results of a permanent rise of 50 percent in the flow rate from non-participation to unemployment. After this shift in job competition from non-participants it takes about 25 years to reach the new equilibrium. The number of unemployed workers receiving welfare benefits rises due to the shock and reaches its new equilibrium shortly after an initial period of overshooting. Employment rises only slowly in the short-run, due to frictions in the matching process.

When vacancies adjust to the permanent rise in the effective supply of labor, employment rises more whereas unemployment is hardly affected though by dropping the lump of labor assumption. The number of individuals receiving unemployment insurance benefits rises due to the higher inflow from employment. Note that the number of unemployed workers stabilizes rather quickly at a higher level, whereas both non-participation and employment continue to fall and rise respectively.

In the new equilibrium the stock of unemployed workers receiving welfare benefits is 60.000 persons higher (+ 29.0 percent), employment is 169.000 persons higher (+ 3.2 percent) and non-participation is 234.000 persons lower (- 6.4 percent). The difference (6.000, + 3.7 percent) is due to the rise in the number of unemployed workers receiving unemployment insurance benefits. On average the unemployment rate has increased from 6.5 to 7.6 percent.

Next we investigate a permanent change in the search effectiveness of non-participants. The dynamic adjustment path after a permanent 50 percent rise in the effective number of search units from non-participation is presented in Figure 6. In the new equilibrium, employment has increased with 690.000 persons (+ 13.1 percent) and non-participation has declined with almost the same number (692.000, - 19.0 percent). Unemployment is hardly affected, since unmatched non-participants do not join the unemployment pool. Once again, employment absorbs more labor when vacancies respond to the increase in the effective supply of labor.

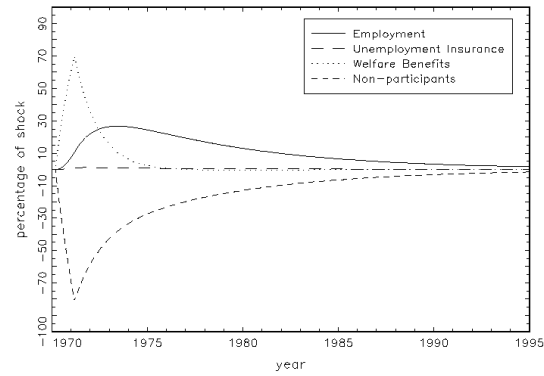
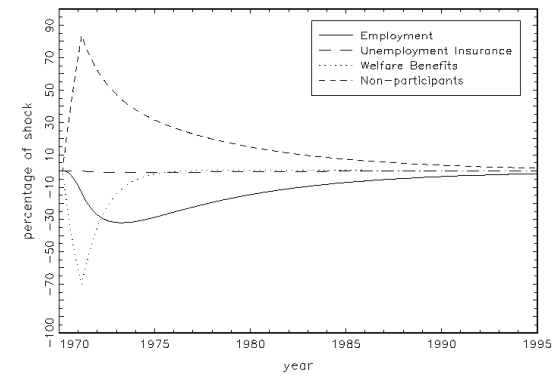
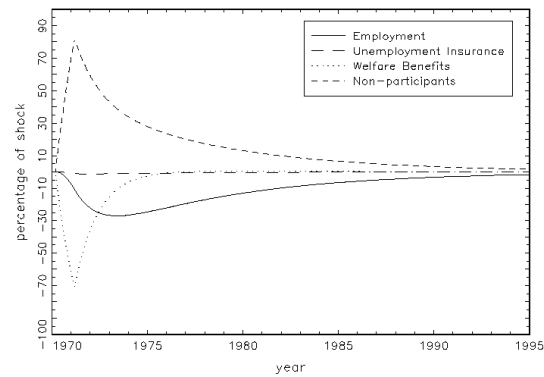
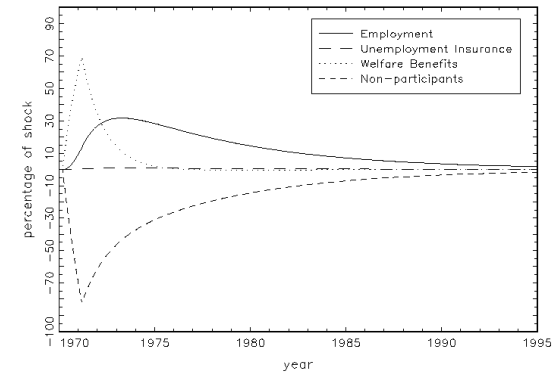
3a: lump of labor assumption ( $V^*$ )3b: labor demand adjustment ( $V/S^*$ )

Figure 3 — Effect of a temporary positive (top) and negative (bottom) change in the flow from non-participation to welfare

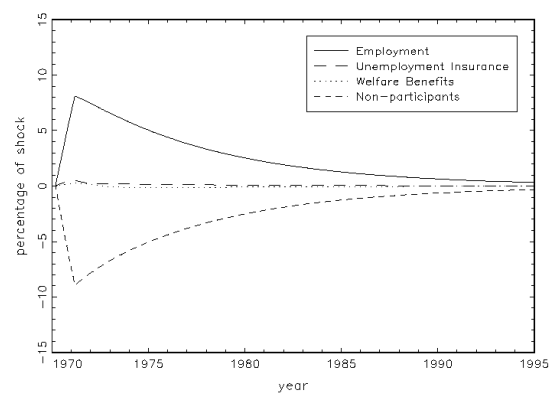
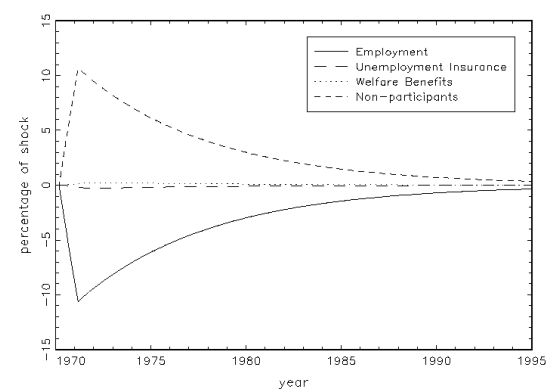
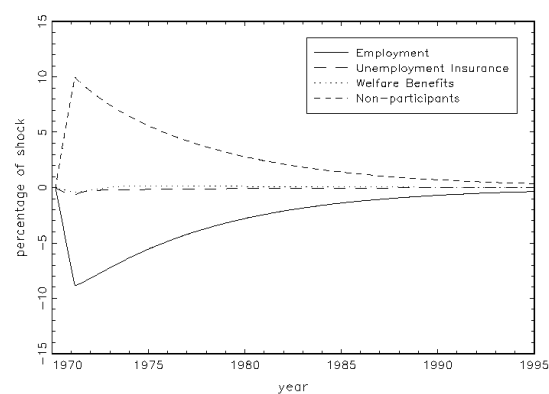
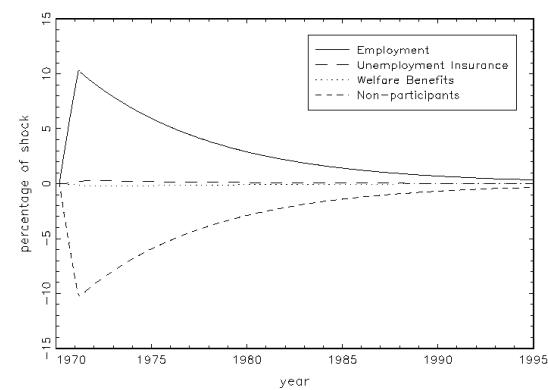
4a: lump of labor assumption ( $V^*$ )4b: labor demand adjustment ( $V/S^*$ )

Figure 4 — Effect of a temporary positive (top) and negative (bottom) change in the share of non-participants that engage in job search

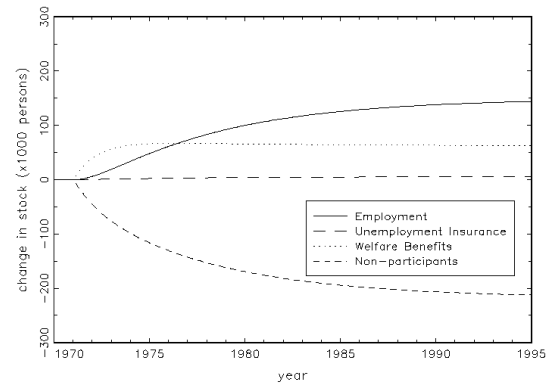
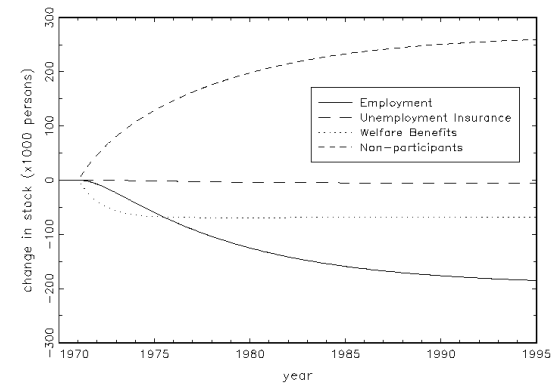
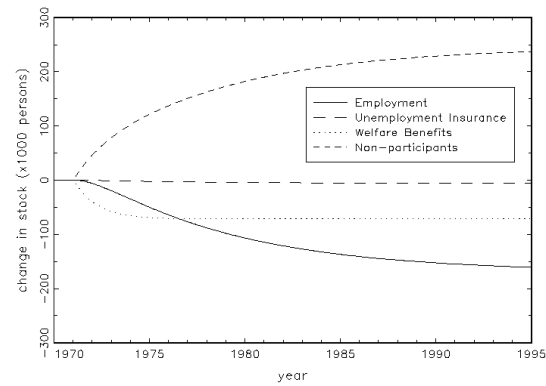
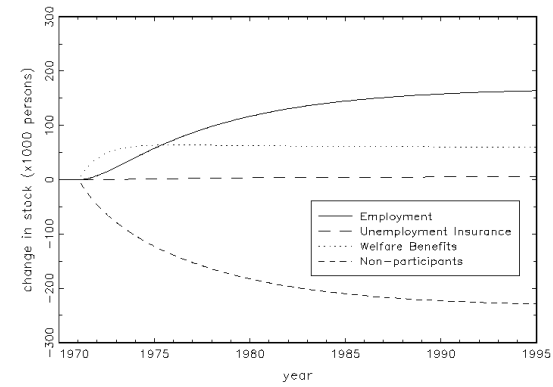
5a: lump of labor assumption ( $V^*$ )5b: labor demand adjustment ( $V/S^*$ )

Figure 5 — Effect of a permanent positive (top) and negative (bottom) change in the flow from non-participation to welfare

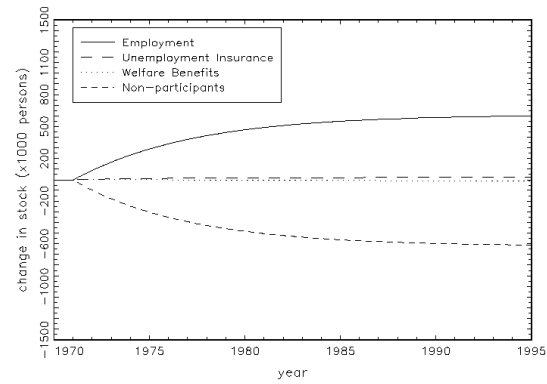
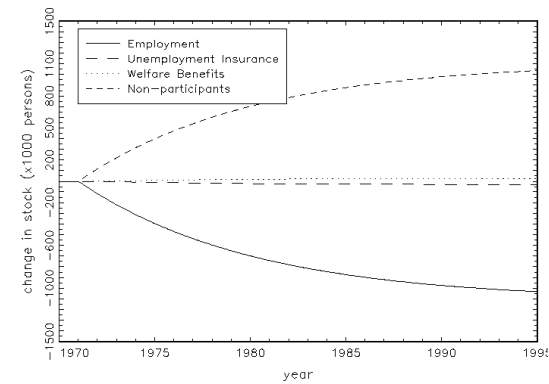
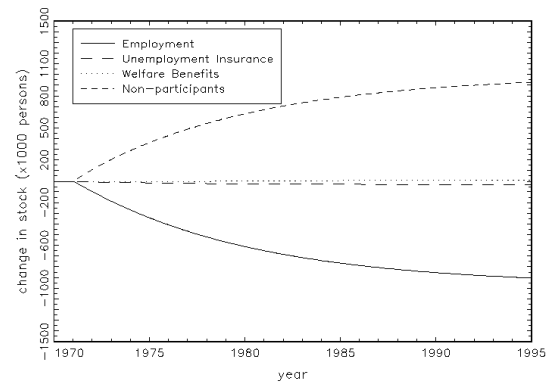
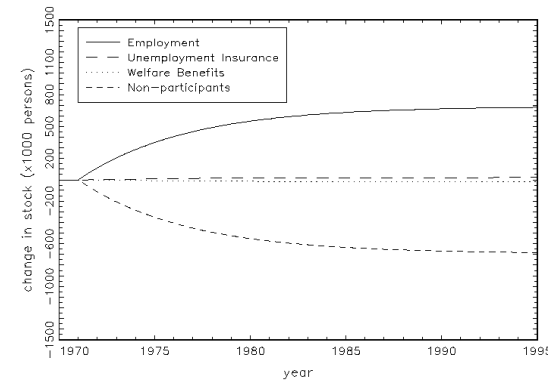
6a: lump of labor assumption ( $V^*$ )6b: labor demand adjustment ( $V/S^*$ )

Figure 6 — Effect of a permanent positive (top) and negative (bottom) change in the share of non-participants that engage in job search



A permanent rise in job competition from non-participants turns out to generate quite limited persistence in unemployment when unmatched additional job seekers remain outside the labor force because the impact on the two different stocks of unemployed workers partly cancels out. This is due to the fact that the higher level of employment induces a higher inflow into unemployment insurance, whereas it has no direct effect on the inflow into welfare. In fact, the flow into welfare falls due to the lower inflow from non-participation.

***Temporary rise/fall in labor demand representing cyclical***

In our model the presence of competing non-participants reduces the responsiveness of the unemployment rate to business cycle swings. When competition from non-participants is absent, unemployed workers are matched to (additional) vacancies more rapidly. When competition from non-participants is present, a positive shock to labor demand is partly absorbed by non-participants, reducing the number of additional job slots available for unemployed job seekers. Complete labor market adjustment takes about 20 years (see Figures 7a and 7b).

The adjustment process is much faster for unemployed workers who receive unemployment insurance benefits than it is for welfare recipients. The same applies to the simulation we have conducted with a model without job competition from non-participants. In fact, there is virtually no difference in adjustment for workers receiving unemployment insurance benefits, whereas competition from non-participants seems to extend the adjustment period for welfare recipients with approximately a third.

It appears that the impact on unemployment of an identical negative shock to the stock of vacancies is asymmetric; negative shocks to labor demand raise unemployment by more than positive shocks reduce it. When competition between unemployed and non-participants is present, a positive labor demand shock of 50 percent temporarily lowers the unemployment rate from its equilibrium value of 6.53 percent to 6.22 percent after about 1.5 years (a decline of 0.31 percentage points). The initial impact on the unemployment rate of a negative labor demand shock is larger. A similar negative demand shock raises the unemployment rate to 7.04 percent, an increase of 0.51 percentage points.

The asymmetry in the response of unemployment to positive and negative shocks to the number of vacancies is due to the diminishing returns in the aggregate matching function. A rise in the number of vacancies has a smaller impact on the number of matches than a fall in the number of vacancies. Note that the number of welfare recipients remains above its steady state level longer than the number of unemployment insurance recipients. A higher number of unemployment insurance recipients implies a delayed rise to welfare benefit recipients in the following periods. Furthermore, a larger stock of non-participants implies a larger inflow from non-participation.

The asymmetric characteristics of labor market adjustment indicate that cyclical disturbances could cause persistence. As a consequence, duration and intensity of the labor demand shocks determine the precise impact and persistence effects.

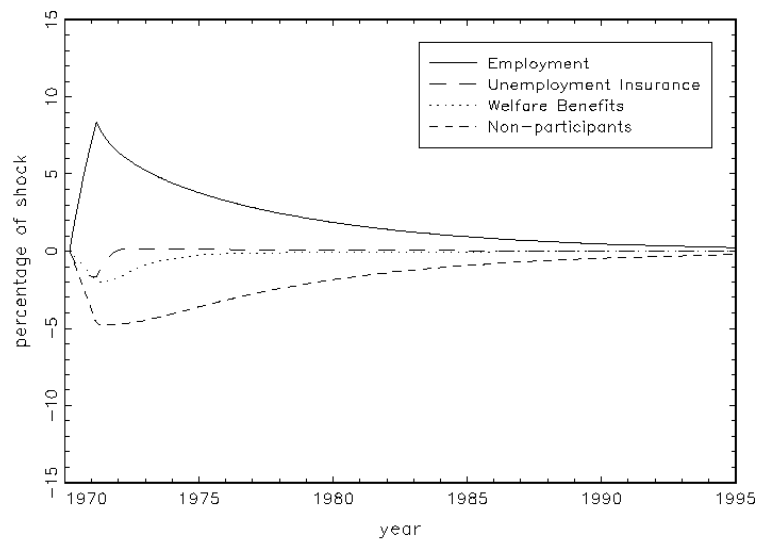


Figure 7a — Effect of a positive change in labor demand when there is competition for jobs between unemployed and non-participants

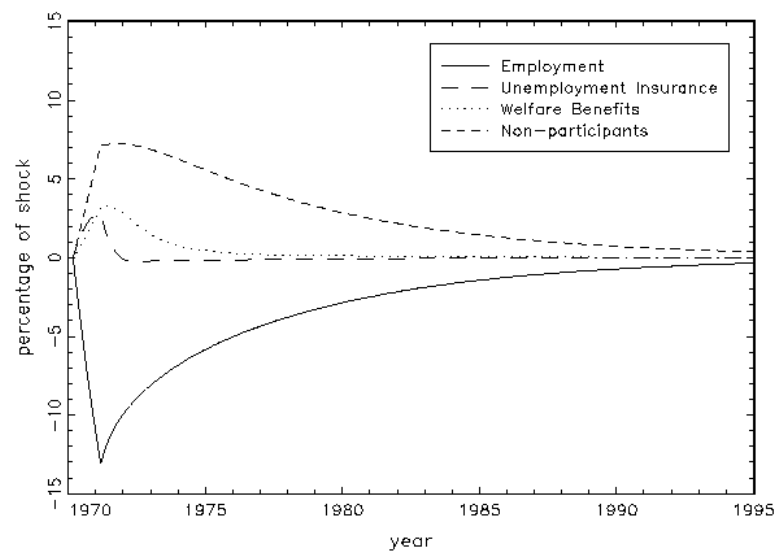


Figure 7b — Effect of a negative change in labor demand when there is competition for jobs between unemployed and non-participants

## 5. SUMMARY AND CONCLUDING REMARKS

The Dutch labor market in the period 1970-1997 seems to be characterized by a paradox. Although employment rose significantly over the last decade, dependence on social security provisions was very persistent. Our empirical stock flow-model which endogenizes adjustment processes to unemployment equilibria, suggests that the paradox can be resolved by considering the rise in the effective supply of labor from non-participants. A permanent rise in the effective supply of labor from non-participants pushes equilibrium unemployment up, in particular long-term unemployment. Whereas the unemployment rate settles at a higher level rather quickly, employment continues to rise. In this respect the model reproduces the behavior of these variables observed in the data. However, the dramatic rise in unemployment arises only when unmatched non-participants join the unemployment pool. Increased competition from non-participants who remain in the pool of non-participants (i.e. claim no benefits) hardly affects the unemployment rate. However, competition from non-participants does matter for unemployment via demand shocks. We find that the larger part of swings in labor demand is absorbed by non-participants, limiting the impact of labor demand shocks on unemployment.

So, our small equilibrium search model highlights two sources of unemployment persistence in The Netherlands. The first source is when, in a period of enhanced labor force participation, non-participants enter the unemployment pool. The second source is the occurrence of cyclical swings. The essential feature why our model generates these outcomes, is that it includes the job competition between unemployed and non-participants in the search process.

These results suggest two important implications for labor market policy. First, it seems feasible to increase the employment rate by promoting labor supply from non-participation as employment adjusts quite smoothly and the time span is not too long. Second, it is important to take an integral approach to policies that aim to promote labor participation and to take into account the effect of job competition from workers outside the labor force for existing job seekers, notably unemployed workers. Although the persistence effect of increased job competition might not be that large in absolute numbers, the social costs can be substantial when a small group at the bottom of the labor market remains inactive and, partly due to job competition, has a very low probability to find a job. This requires a wide range of labor market policies, as there is not a single policy that completely solves the Dutch paradox of employment growth and persistent dependency on social benefit schemes. However, evaluation of the effects and effectiveness of individual measures from that wide range of policies requires a model with much more detail than the equilibrium search model in this article.

## APPENDIX: DATA SOURCES AND DESCRIPTION

All numbers  $\times 1000$ .

$M_{ui}$  Job matching from the stock of unemployed workers receiving unemployment insurance benefits. Source: LISV (1998).

$M_{wb}$  Job matching from the stock of welfare recipients. Source: Kock (1998, 2000).

$M_n$  Job matching of persons currently outside the labor force (non-participants). Source: Kock (1998, 2000).

$\pi_{N \rightarrow WB}$  Flow rate from non-participation to unemployed workers receiving welfare benefits. Source: Kock (1998).

$\pi_{UI \rightarrow WB}$  Flow rate from unemployed workers receiving unemployment insurance benefits to unemployed workers receiving welfare benefits. We use data that represent unemployed workers receiving unemployment insurance benefits that are no longer entitled to these benefits because they have reached the maximum term. Outflow due to reaching the maximum term can also take place to non-participation, but we make the reasonable assumption that these people continue to be part of the labor market and all flow into welfare. Source: LISV (1998, Table 6.2).

UI Stock of unemployed workers receiving insurance benefits, excluding civil-servants and self-employed. About 70 percent of the working population is covered by unemployment insurance (WW). Source: LISV (1998, Table 6.6 and 6.2) and own calculations.

WB Stock of unemployed workers receiving welfare benefits. Source: LISV (1998, Table 2.1) and Kock (1998).

N Stock of non-participants (between 15 and 65). Source: CBS (Population Statistics) and Kock (1998).

E Employed workers (employees and self-employed) with a regular job of 12 hours a week or more. Source: CPB (Macroeconomic time-series).

V Vacancies. Source: CBS (Monthly Social Economic Statistics) and Muysken, Bierings and De Regt (1991).

## REFERENCES

- Bean, C.R. (1994), 'European unemployment: a survey', *Journal of Economic Literature*, **32**, 573-619.
- Broersma, L. (1997), 'Competition between employed and unemployed job searchers: is there a difference between the UK and The Netherlands?', *Applied Economics Letters*, **4**, 199-203.
- Broersma, L. and J.C. van Ours (1999), 'Job searchers, job matches and the elasticity of matching', *Labor Economics*, **6**, 77-93.
- Broersma, L., F.A.G. den Butter and U. Kock (2000), 'A national accounting system for worker flows', *Economics Letters*, **67** (3), 331-336.
- Butter, F.A.G. den and M. van Dijk (1998), 'The pace of job creation and destruction, cyclical shocks and employment dynamics', *Labour*, **12**, 613-631.
- Butter, F.A.G. den and C. Gorter (1999), 'Modelling labor market dynamics with on-the-job search', *Economic Modelling*, **16**, 545-567.
- Central Planning Bureau (CPB), *Macroeconomic time-series* (Lange Reeksen), Den Haag.

- Central Bureau of Statistics (CBS), *Monthly Social Economic Statistics* (Sociale Maandstatistiek), Heerlen.
- Central Bureau of Statistics (CBS), *Labor Market Survey* (Enquête Beroeps Bevolking), Voorburg.
- Chen, Y.-F., Snower, D.J. and G. Zoega (2003), Labour-market institutions and macroeconomic shocks, *Labour*, **17**, 247-270.
- Davis, S.J., J.C. Haltiwanger and S. Schuh (1996), *Job Creation and Destruction*, MIT Press, Cambridge/London.
- European Commission (1999), *Employment in Europe*, Brussels.
- Gorter, C. and J.C. van Ours (1997), 'Matching unemployment and vacancies in regional labor markets: an empirical analysis for The Netherlands', *Papers in Regional Science*, **73**, 153-167.
- Kock, U. (1998), 'Constructing labor market flows for The Netherlands using macro data from social security provisions; 1970-1995', Free University research memorandum, 1998-40.
- Kock, U. (2000), 'Labor market flows in The Netherlands' (in Dutch), *Maandschrift Economie*, **64** (2), 147-166.
- Lindbeck, A. (1995), 'Hazardous welfare state dynamics', *American Economic Review*, **85** (2), Papers and Proceedings, 9-15.
- Ljungqvist, L. and T.J. Sargent (2005), 'Jobs and Unemployment in Macroeconomic Theory: A Turbulence Laboratory', *CEPR Discussion Paper*, no. 5340, CEPR, London
- Muysken, J., H. Bierings and E. de Regt (1991), 'Structural unemployment in The Netherlands' (in Dutch), OSA Working Paper, W82.
- National Institute for Social Insurance (LISV (1998)), *Chronicle of Social Benefits* (Kroniek van de Sociale Zekerheid), Amsterdam.
- Organization for Economic Cooperation and Development (OECD (1998)), *Economic Surveys; The Netherlands*, Paris.
- Organization for Economic Cooperation and Development (OECD (2002, 2005)), *Employment Outlook*, Paris.
- Pissarides, C.A. (2000), *Unemployment Equilibrium Theory*, 2<sup>nd</sup> edition, Cambridge (MA): MIT Press.
- Snower, D.J. (1997), 'Evaluating unemployment policies: what do underlying theories tell us?', in D.J. Snower and G. de la Dehesa (red.), *Unemployment policy: Government options for the labor market*, CEPR, Cambridge: Cambridge University Press, 15-53.
- Van den Berg, G.J. and G. Ridder (1998), 'An empirical equilibrium search model of the labor market', *Econometrica*, **66** (5), 1183-1221.
- Van Ours, J.C. (1995), 'An empirical note on employed and unemployed job search', *Economics Letters*, **49**, 447-452.